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Signs of altered psychomotor capacity and use of alcohol and other drugs among nightclub patrons who drive in the city of São Paulo, Brazil

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ABSTRACT

Objectives: To investigate the occurrence of signs of altered psychomotor capacity (SAPC) associated with the violation of the dry law at the exits of nightclubs in the city of São Paulo, Brazil.

Methods: Data from drivers participating in the *Balada com Ciência* project were used. Alcohol dosages were measured with breathalyzer test. The use of other drugs was obtained by interviewees' self-report. SAPC (speech, walking, glazed eyes, and alcohol odor) were verified by the interviewers at the time of the interview and categorized as "no sign" or "at least one sign". All measurements were evaluated at the exit of the nightclubs. The population description considered the sample weighting. Logistic regression analysis evaluated the association between the occurrence of SAPC, alcohol and other drugs use, controlling for sociodemographic variables.

Results: At nightclubs, the SAPC among drivers are about 8 times higher when the breath alcohol concentration is above 0.05 mg/L if compared with those who did not drink alcohol, and about 30 times higher when the alcohol concentration was ≥ 0.34 mg/L in exhaled air. This finding is not generally verified in the literature for those who report the use of drugs inside nightclubs, which is interesting, since 20.4% of the interviewed population reported using drugs in the places surveyed.

Conclusion: This study suggests the potential of using the Perham (2007) physical test for alcohol intoxication in sobriety checkpoints at the exit of nightclubs. However, the verification of these signs is not enough for the identification of drug use by drivers.

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Drinking and driving; nightclubs; alcohol; traffic law; Brazil



Introduction

According to the Brazilian Traffic Law, popularly called "dry law," to control drunk drivers, the authorities must give priority to the Breath Alcohol Concentration (BrAC) testing. To be considered as an infraction, when evaluated by a police authority, the Brazilian National Transit Council considers a BrAC test yielding a value equal or higher than 0.05 mg/L, or with signs of altered psychomotor capacity (SAPC). The alcohol concentration in the expired air determines the traffic infraction as "traffic offense", when the BrAC is from 0.05 mg/L to 0.33 mg/L, or as "traffic offense and crime", when $\text{BrAC} \geq 0.34$ mg/L. As previously described by Drummond-Lage et al. (2018), according to the Brazilian Federal Constitution, the one has the right to not produce evidence against himself, but at the same time, in these cases, the assessment of changes in psychomotor ability by a doctor or traffic officer is sufficient to indicate the degree of drunkenness (Drummond-Lage et al. 2018; Brasil Constituição 1988). Moreover, the current Brazilian Traffic Code has an article (Brazil 2008) explaining what must happen if a driver refuses a test, clinical examination, or other procedure that allows for the evaluation of whether the


driver is under the influence of alcohol or other psychoactive substance. If the subject refuses to do the test, he may suffer penalties such as traffic tickets and suspension of the right to drive for 12 (twelve) months and also administrative measures, such as vehicle seizure.

The analysis of drivers' SAPC is subjective, since aspects such as appearance, attitude, spatial orientation, memory, motor, and verbal skills are observed. According to this assessment, the driver may be referred for further testing, such as blood tests or exams performed by specialized laboratories in the case of other psychoactive substances (Brazil 2017). In this context, associating the SAPC with measurements obtained by the biological test (breathalyzer) is important to analyze the limits imposed by the law and the alcohol breath concentration.

In 2017, a more accurate and severe Law (13.546/17) came into force and imposed a new discipline in the relationship between homicide, personal injury crimes and the crime of drunk driving. The new law added paragraphs that treat inebriation as a qualifying circumstance of homicide and personal injury. In the case of homicide, if the individual is driving under the influence of alcohol or any other

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psychotropic substance, the new sentence is five to eight years in jail. In case of personal injury, if the driver has altered psychomotor capacity due to the influence of alcohol or other psychoactive substance that causes dependence, and if the crime results in a severe or very severe bodily injury, the sentence is two to five years in jail.

Despite the assessment of changes in the psychomotor capacity and strict punishment to drivers, 24.7% of nightclubs patrons in São Paulo leave the nightclubs with BrAC ≥ 0.34 mg/L (Wagner and Sanchez 2017), which suggests a perception of impunity in the law enforcement due to inconsistency and the presence of some legal loopholes (Pechansky et al. 2016). This article aims to analyze the occurrence of SAPC associated with the violation of the “dry law” by patrons at the exit of nightclubs in São Paulo, Brazil.

Methods

Design and population

This is a longitudinal study conducted with a portal survey including 369 driving patrons, a population-based representative sample of Brazilian nightclub patrons in the megacity of São Paulo, Brazil, in 2013, the “*Balada com Ciência*” portal survey study (Sanchez et al. 2015). Data collection was carried out from January to July 2013, mainly on Friday, Saturday and Sunday nights, from 11 pm to 7 am, each day, at the entrance and exit of the nightclubs.

“*Balada com Ciência*” study used a 2-stage cluster sampling portal survey. The first stage consisted of identifying a systematic sample of nightclubs using a selection probability proportional to the nightclub’s maximum capacity. The second stage consisted of completing systematic sampling of every third person in the entrance line.

A target sample size of 1,600 patrons was calculated by considering an absolute precision of 5%, 95% confidence interval (CI), the use of 2-stage cluster sampling and a design effect of 2 (Lwanga et al. 1991). Given a possible refusal rate of 30% and maximum loss of 40% in the follow-up (entrance and exit) (Clapp et al. 2007), the researchers determined 2,912 patrons should be approached. A total of 3,063 approaches were completed at the 31 nightclubs that participated in the study, and 2,422 interviews were held (79.1% rate of acceptance among respondents at the entrance). Out of the young people who agreed to participate in the entry, 1,833 were also interviewed at the exit (76% completed the follow-up interview). Details regarding the sample selection procedure used in the nightclubs were also shown by Carlini et al. (2014) and Santos et al. (2015).

Out of the 2,422 patrons interviewed at the entrance of the nightclubs, 22.4% ($n = 520$) were driving. In the follow-up interview at the nightclub exit, out of the 520 patrons who reported driving at the nightclub entrance, 71% ($n = 369$) reported the intention of driving home after the party. This study focused on the 369 patrons who drove to and from the nightclub at the night of the survey.

The Research Ethics Committee of the Universidade Federal de São Paulo (protocol 21477) approved this study.

Interviews were conducted only with patrons showing signs of light intoxication, following the guidelines for screening described by Perham et al. (2007).

Variables and measures

Breath Alcohol Concentration (BrAC): Drivers who participated in the entrance and exit surveys performed a breathalyzer test [calibrated Dräger Alcotest 7410 plus, Germany, range of measurement of the equipment and the precision ($0.00\text{--}4.00 \pm 0.01$ mg/L)] and received a bracelet with a unique code to identify them at the nightclub.

According to Contran, a “traffic offense” is committed when BrAC is from 0.05 mg/L to 0.33 mg/L, and in this case administrative fines should be issued, including financial fines and seizure of driver license and vehicle. A “traffic offense and crime” happens when BrAC ≥ 0.34 mg/L. In this case, the individual will be prosecuted and suffer penalties such as detention (six months to three years in jail), financial penalties and suspension of license to drive motor vehicles. For the analyses described in this article, BrAC was categorized according to Brazilian National Transit Council and then classified as zero BrAC (≤ 0.04 mg/L), traffic offense (0.05–0.33 mg/L) or traffic offense and crime (≥ 0.34 mg/L) (Wagner and Sanchez 2017).

Signs of altered psychomotor capacity (SAPC): The interviewers at the exit of the nightclubs evaluated the physical signs of intoxication according to some signs of psychomotor impairment classified as slurring, slow walking, glazed eyes, and alcoholic odor, according to Perham et al. (2007).

For statistical analysis, these signs were grouped and classified as “Signs of altered psychomotor capacity.” This variable was categorized as “None”, and “At least one” when at least one positive sign of psychomotor impairment was observed.

Characteristics of the individual and social environment: The following variables were analyzed: gender (male/female); age range (18–24, 25–34, 35–44, 45+); marital status (single, other); and educational stage (high school, college, post-graduate). The type of nightclub was classified by musical style in eclectic/pop-rock (plays several musical styles at the same night), electronic and others, and this categorization were registered by the field staff during observational data collection (Carlini et al. 2014). The variable “illicit drug use inside the nightclub” included self-reports of at least one of the following substances: marijuana or hashish, cocaine, ecstasy, tobacco, crack, inhalants, ketamine, methamphetamine, other amphetamines, benzodiazepines or hallucinogens (such as LSD, psilocybin and peyote).

Statistical analysis

Descriptive analyses were conducted on the individual and social environment characteristics, BrAC concentration, and SAPC. Comparisons were performed using the Pearson’s Chi-square (χ^2) test with the Rao-Scott correction (Rao and Scott 1987). The description incorporated weights to correct the different selection probabilities of the participants, and

Table 1. Association between signs of altered psychomotor capacity according to the interviewer's assessment at exit of nightclub, BrAC level classified according to the Brazilian law and illicit drug use inside the nightclub among driving patrons in São Paulo, Brazil – “Balada com Ciência” portal survey (N = 369).

	At least one ^{1,4}			
	UnOR(95%CI)	p-value	AdOR(95%CI) ⁵	p-value
BrAC²				
Zero BrAC	1		1	
Traffic offense	10.7(4.4-26.3)	<0.001	8.8(3.5-22.1)	<0.001
Traffic offense and crime	32.8(14.3-75.3)	<0.001	29.2(12.3-69.5)	<0.001
Illicit drug use inside the nightclub³				
Yes	2.0(1.2-3.7)	0.014	1.6(0.8-3.4)	0.249

1. Presence of signs of altered psychomotor capacity at exit of nightclub: “At least one” included at least one positive response according to the interviewer's assessment.

2. Drivers' breath alcohol concentration (BrAC) classified according to Resolution No. 432, passed January 23, 2013: traffic offense (0.05-0.33 mg/l) and traffic offense and crime (≥ 0.34 mg/l).

3. Illicit drug use inside the nightclub included the use of at least one of the following substances: marijuana or hashish, cocaine, ecstasy, tobacco, crack, inhalants, ketamine, methamphetamine, other amphetamines, benzodiazepines or hallucinogens (such as LSD, mushrooms and peyote).

4. Binomial logistic regression with “None” Field sobriety test at de exit of nightclub as reference.

5. Model adjusted by sex, marital status, education and type of nightclub.

UnOR = Unadjusted odds ratio.

AdOR = Adjusted odds ratio.

the results were expressed as weighted values. All p-values < 0.05 were considered statistically significant. The survey (svy) package in Stata14® version was used, which provided procedures for the analysis of complex sample data. The software allowed for the incorporation of different weights of observations that may influence the parameter estimates of the total population, considering the effect of sampling on the variance estimates.

Binomial logistic regression was used to analyze the association between SAPC according to the interviewer's assessment at the exit of the nightclub, BrAC level classified according to the Brazilian law and illicit drug use inside the nightclub. Associations with a p-value < 0.20 in the univariate analyses were incorporated into the binomial logistic regression using forward selection. The magnitude of the associations was estimated using odds ratios and their respective 95% confidence intervals.

Results

Out of the 2,422 patrons interviewed at the entrance of the 31 selected nightclubs in the city of São Paulo, 35.5% (n = 869) were passengers; 25.0% (n = 602) arrived by bus; 12.1% (n = 297) arrived by taxi; 4.5% (n = 105) arrived in another way but did not drive (walking, bicycle, subway); 0.4% (n = 9) arrived by motorcycle and 22.4% (n = 520) were driving [missing data (n) = 20]. During the follow-up interview at the nightclub exit, out of the 520 patrons who reported driving at the entrance, 71% (n = 369) intended driving home and 29% (n = 151) reported not intending to drive after leaving the nightclub. At the entrance, 80.1% of the patrons had zero BrAC, 14.9% had BrAC meeting the “traffic offense” criteria and 5% had BrAC meeting the “traffic offense and crime” criteria (Wagner and Sanchez 2017).

The sample was mainly composed of male drivers, aged 25 – 34, single, college students, patrons of electronic nightclubs and who have not reported drug use inside the nightclub. We found higher prevalence of drivers with zero

BrAC, followed by “traffic offense and crime” and “traffic offense”. Most drivers (81.7%) did not show SAPC; however, 18.3% of them had at least one sign of intoxication (See Table A1 in the Appendix).

We found higher prevalence of SAPC among drivers whose BrAC was classified as “traffic offense and crime”; the most prevalent sign was slurred speech and the least prevalent was glazed eyes. Among drivers committing a traffic offense, the most frequent sign was alcoholic odor; 61.6% of the driver patrons classified in “traffic offense and crime” showed one SAPC. Among drivers who used illicit drugs inside the nightclub, 33.4% showed at least one or more signs (See Table A2 in the Appendix).

The distribution of baseline characteristics by SAPC is shown in Table A3. Among those who showed at least one sign, most were men, singles, patrons of eclectic/pop-rock nightclubs who did not report illicit drug use inside the nightclub, and with BrAC classified as “traffic offense and crime” (See Table A3 in the Appendix).

Finally, the associations between SAPC according to the interviewers' assessment at the exit of the nightclub, BrAC level classified according to the Brazilian law, and illicit drug use in the nightclub among driving patrons are shown in Table 1. Driving patrons classified as “traffic offense” had 11 times more chance to show one or more SAPC. After adjustment with control variables, this chance decreased to 8.85 times when compared to those who did not show any SAPC evaluated. Among the ones committing a traffic offense and crime, the chance to show at least one of the signs was 32.81. After adjustment with the control variables, the odds were 29.18. For illicit drug use inside the nightclub with one or more SAPC, the association was statistically significant only in the unadjusted model (Table 1).

Discussion

Our results point out a strong association between the identification of at least one sign among drunk drivers at nightclub exits in the city of São Paulo and the alcohol

concentration in the expired air. The odds are about 8 times higher when the driver has a breath alcohol concentration of 0.05 mg/L compared to those who did not drink alcohol and about 30 times higher when the alcohol concentration was ≥ 0.34 mg/L in the exhaled air. This association was not verified for drivers who reported use of illicit drugs inside the nightclubs, which is interesting, since 20.4% of the interviewed population reported using illicit drugs in the places surveyed.

We highlight that this is a specific evaluation of patrons leaving nightclubs. In previous surveys, we found in this same population (drivers or not) “binge drinking” BrAC among 29.6% of the men and 22.1% of the women interviewed (Sanchez et al. 2015). Among the drivers, about 14% had already met the BrAC traffic offense criteria and 5% had reached the BrAC traffic offense and crime criteria (Wagner and Sanchez 2017). It is a population with good chances of drunk driving and of showing signs of alcoholism, since, among the risk factors associated with alcohol consumption in this population, drinking and driving was the most frequent (Sanchez et al. 2015). As it happens in Brazil, other studies with nightclub populations show that most participants underestimate the alcohol concentration measure and feel able to drive their vehicles (Martins et al. 2013).

This should be considered in the identification of signs by trained persons and how this identification will determine the criminal sanctions under the new, more stringent 2017 law. In the case of serious bodily injury caused by drunk drivers or drivers under the influence of illicit drugs, the Law provides for a sentence of two to five years in jail. To collect data for this research, our undergraduate and graduate students were trained to identify these signs and, with the confirmation of alcoholic concentrations of the expired air, they would more reliably identify drivers’ drunkenness. However, evidence show assessments of psychomotor alterations are inaccurate in terms of drunkenness detection compared with BrAC (Drummond-Lage et al. 2018) results in Brazilian populations undergoing clinical testing and among clinical cases of intoxication in health services from 17 countries in the world (Bond et al. 2014).

In general, physical signs are important, but some individuals are tolerant to alcohol. In such cases, clinical signs of poisoning should be evaluated by an experienced physician (Bond et al. 2014) and not by a traffic officer. In our population of nightclub patrons, we lacked data on prior alcohol exposure to assess signs of alcohol tolerance, so the relation between BrAC values may not match the occurrence of signs, making these drivers liable to drunk driving.

For the lack of association between SAPC and illicit drug use, the scenario becomes more worrying. As mentioned earlier, although 20.4% of our population reported alcohol use in addition to other drugs inside nightclubs, our findings do not indicate association with drunkenness, when considering concomitant drug use (polydrug use). In 2016, Christophersen et al. (2016) published a review of trends in alcohol and drug use among drivers in some countries,

including Brazil. The authors considered the pattern of illicit drug use among drivers related to the pattern of drug use in the general population, and evidenced that most individuals choose not to drive while under the influence of drugs. In countries such as Norway, for example, when evaluating drivers who were approached at nightclubs, they found that individuals frequently used cocaine or cannabis combined with alcohol and other drugs.

According to Christophersen et al. (2016), the lessons learned in higher-income countries may have applicability in low and middle-income countries, but the latter lack legal structure and enforcement resources, as in Brazil. Despite the impact on the magnitude of death rates (Abreu et al. 2018), any discussion of future trends should consider the rapid changes in the country’s income levels (Christophersen et al. 2016) and population behavior. For example, between 2013 and 2014, in the city of Rio de Janeiro, 4,756 drivers of cars, motorcycles, and utilities were intercepted to verify the breath alcohol concentrations, according to the dry law. Out of these drivers, 229 (4.8%) refused to take the test because they were likely to be drunk and, by refusing it, “escaped” the harsher Brazilian Traffic Code penalties (Jomar et al. 2019). In these cases, the SAPC assessment could be used as an indicator of drunkenness; however, its use could be limited by the ability of the traffic agent to correctly identify the SAPC and by the driver’s tolerance to alcohol.

For Fell (2019), the most important and effective strategies to reduce the number of accidents are the application of random breath testing and the calibration of the sobriety checkpoint evaluation. For our population of interest, the author suggests a policy of refusing to sell alcohol to drunk clubbers, that is, people with signs of drunkenness, which may be very difficult to be applied in nightclubs.

Our study presents some limitations. First, it included a population-based sample of nightclub patrons in the city of São Paulo, and these results cannot be extrapolated to the general Brazilian population and other population segments. The main limitation of this study was the acceptance rate (66%) among the sampled nightclubs, which may have compromised the inclusion of certain categories of patrons. The 76% follow-up rate shows that a portion of the entrance sample was lost; however, to minimize the bias, the nightclub patrons lost at the follow-up were corrected by weighting. Moreover, there is the hypothesis that patrons who were intoxicated could leave without participating in the exit interview. Thus, the number of non-intoxicated patrons may be overestimated. Finally, considering that only regular nightclubs with entrance and exit control were included and that these almost always charge an entrance fee, our final sample included wealthier patrons. Also, funk parties that happen on the favelas streets or sheds were not included in the sample (Wagner and Sanchez 2017). Moreover, data on accidents/fatalities related to alcohol or other drugs was not collected in our study and the results only consider the BrAC level (exposition) and not the final consequence (outcome).

This study suggests the potential of using the physical test proposed by Perham et al. (2007) for alcohol consumption in sobriety checkpoints at the exit of nightclubs. However, SAPC are not enough to identify drivers' drug use. Thus, in Brazil, for law enforcement, it is essential to implement points for random selection of drivers in the busiest urban areas of the nightlife economy.

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Data availability statement

Data is available from corresponding author upon request

Declarations of competing interest

The authors are aware of the Journal's conflict of interest policy and have no related activities to disclose.

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